

When Do Operational Event Become a
Systemic Concern:
An Agent Based Model of the LVTS

Discussion

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Highlights

- Partial outages: one participant cannot send payments but is still able to receive them
- **Two Questions:**
 - can a partial outage have a systemic effect?
 - show **ABM** contribution
- Analysis based on
 - simulation model, capturing the working of the LVTS
 - real time data
 - behavioral assumptions on *other participants' reaction*

Maintained Assumptions

- How banks process payments that pass/ do not pass bilateral and multilateral credit limits
 - Until “Reaction” banks continue to send payments to impacted bank.
 - After Reaction, they put payment inside outage queue
- Constant CB behavior vis à vis credit limits
- Simplifying assumptions (collateral, processing times...)

Payment System Performance Indicators

Outage ends at 4.30 pm

- Can the payment system settle by 6 pm?
 - % of unsettled volume close to zero irrespective of reaction time
- How much time is left before 6pm when the system recovers?
 - too little time may be left: extension needed
- Are other banks impacted?
 - NetAQV: weighted average, across participants, of queued payments, averaged over T 10-minutes intervals
 - .1 to.5 billions at 4.30, depending on reaction
- How many costs does the outage entails? ?

Comments by an Outsider

- Relevance of Partial Outages
- Possibility of Systemic Breakdown
- Event Study

Relevance of Partial Outages

- Table 1 with 41 of events, duration, value of payments submitted with/without outages to the system...not very telling to an outsider: cost to the bank? to the system?
- *“Disasters of Note”* Royal Bank of Canada upgrading software, June 2004, on payday
- “Millions of customers” inconvenienced
 - transactions did not reflect in their accounts for up to a week
 - customers of other banks affected as payment from customers of RBC would not have come through when expected
 - 1 billion dollar claim in lawsuit

Relevance of Partial Outages

(Lacker, Richmond Fed, 03)

- Payment system disruptions common to Banking crises 1863-1914
 - Herstatt failure 1974
 - *Bank of NY software problem 1985*
 - Stock Market Crash 1987
 - *September 11*
- Characteristics:
 - caused by solvency or operational problems
 - possible bank runs
 - Central Bank Intervention
- High incidence in last decades of operational outages due to electronic transfers
 - Causes: software, power, storm, physical attack, virus
- PARTIAL OUTAGES GET VERY RELEVANT!

Why Should Operational Outages Cause a Systemic Crisis?

- Partial Outage under analysis causes the affected participant to have excess balances and the others to have lower than average balances
- Central Bank may manage this situation, as it did with Sept 11, if banking solvency is not a concern
 - lending to affected counterparts at (below) market rates
 - against assumption of constant CB behavior

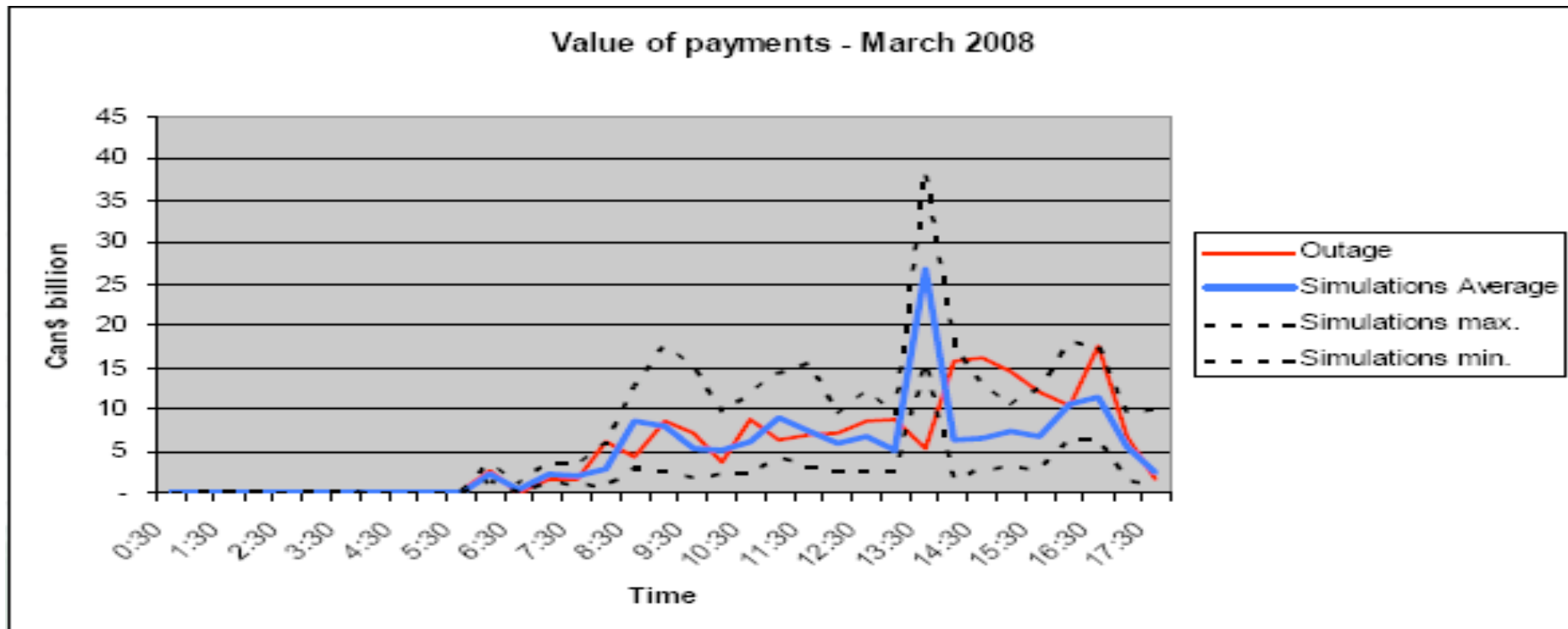
Why Should Operational Outages Cause a Systemic Crisis?

- Was there ever an operational outage to one bank causing a big systemic problem *absent* solvency issues?
- If not, then essential ingredient are the (behavioral consequences) of weak banks, together with the operational outage
 - Additional “informational features” of LVTS: how it disentangles operational and solvency problems, and how fast it communicates them
 - Reaction includes 1. time it takes for impacted bank to inform CPA 2. time for CPA to inform members
 - discuss assumption concerning “reaction”, i.e. communication from impacted bank to CPA and from CPA to other banks

Model Validation

(one event in March 2008 in red)

Why is there a peak simulated payment at lunch time?
Is this a “counterfactual” feature of the simulation model,
Or was it a peculiar feature of this day?



Add Event Study as Complement to Sim Method

- 41 events in the LTVS
- “Normal delay”: NetAQV on days without outages
- “Excess delay”: XNetAQV **past** the outages
 - Is the average XN statistically different from zero (at different times)?
 - Is there a systematic relationship to (i) indicators of interventions by CB/CPA and (ii) solvency problems of the impacted bank
- If other segments included, insight on how characteristics impact reaction

Validation on several days

- How well does the average (excess) simulated response differ from the average (excess) real one?
 - Feedback on behavioral assumptions for banks and CB

Summing up

- Validation over several days through event study
- Discuss outage incidence, outage costs and system transparency
- Two scenarios
 - No solvency issue // CB releases credit limits
 - Bank solvency issues // CB does not release credit limits, longer reaction times